

CALIFORNIA BLUEBERRY

PROJECT PLAN / RESEARCH GRANT PROPOSAL

Work group / Department: USDA-ARS-SJVASC, Crop Protection and Quality Unit

Project Year: 1 (2012)

Anticipated Duration of Project: 2 years

Project Title: The postharvest fumigation of California blueberries to eliminate insects with potential to serve as export trade barriers

Principle Investigator: Spencer S. Walse

USDA-ARS-SJVASC, 9611 S. Riverbend Ave, Parlier, CA 93648,
(559) 596-2750, fax (559) 596-2792, spencer.walse@ars.usda.gov

Cooperating Investigators:

Steve Tebbets, USDA-ARS-SJVASC, (559) 596-2723, steve.tebbets@ars.usda.gov

Current 2012 Funding Request: \$20,417

BACKGROUND/JUSTIFICATION

The spotted wing drosophila, *Drosophila suzukii* (Matsumura), is a pest of serious concern to western U.S. blueberry producers and shippers, as it has been found in key production regions along the Pacific coast. The brown marmorated stink bug (BMSB) is very likely to be a pest of concern to certain countries that import blueberries from California USA. Although the economic consequence(s) of these pests are unknown, a quantitative confirmation of postharvest methyl bromide (MB) and phosphine (PH₃) treatments will be conducted to prove that they can be eliminated from marketing channels. The APHIS MB T101i-1 blueberry import schedule (T > 70 °F, 2lbs /1000ft³, 3h) will serve as an initial benchmark for control; schedule development will then graduate toward conditions recommended by industry for blueberry export from CA (47 < T < 70 °F, 2-4lbs /1000ft³, 2-3 h). In addition, low-temperature (33 – 42 °F) phosphine fumigations will also be conducted; this type of fumigation has the advantage of not requiring the cold-chain of fruit storage to be broken, thereby increasing the chance of decay and phytotoxicity. It should be noted that cold-treatments can also be effective and will be explored; however, the time required for treatment (ca. 5-22 day) make this type of treatment undesirable in many marketing scenarios including exports.

Long-term research goal. The overarching goal of this project is to ensure pest-free blueberries are channeled to markets.

Short-term research goal. Prove that postharvest MB and phosphine fumigation schedules can be used to eliminate SWD and BMSB from California blueberries.

2012 OBJECTIVES:

This project is planned in phases as indicated below. Each phase will have its own goals and these goals will feed those of the following phase. A timeline for each phase will be established when the research commences.

Phase I. Establish a colony of SWD at the USDA-ARS SJVASC in Parlier, CA as well as a colony of BMSB at the Contained Research Facility at University of California at Davis with the throughput necessary to routinely conduct fumigation studies.

Timeline: Already accomplished.

Year 1 (2012) – MB & PH3: laboratory scale.

Phase II. Determine mortality of SWD eggs and larvae in infested blueberries, as well as, pupae and adults in cages to MB in 1ft³ chambers at 43, 50, 60, and 70 °F. Determine mortality of BMSB nymphs (1st-5th instars), and adults in 1ft³ chambers at over same temperatures. Establish and report dose-mortality regressions with statistical validity to establish most fumigant-tolerant life stage of each species (Probit v. 2007 software).

Phase III. Determine the mortality of PH3 as well as PH3-oxygen mixtures to eggs and larvae in infested blueberries, as well as, pupae and adults in cages in 1ft³ chambers at 35 °F. Determine mortality of BMSB nymphs (1st-5th instars), and adults in 1ft³ chambers at same temperature. Establish and report dose-mortality regressions with statistical validity to establish most fumigant-tolerant life stage of each species (Probit v. 2007 software).

Phase VI. A blueberry postharvest quality evaluation will be performed to identify any potential phytotoxicity that occurs from MB as well as PH3 exposure at dosages that are efficacious for killing the most tolerant life stage of SWD and BMSB. (While the SJVASC does have personnel with expertise in this area, this evaluation can be done by whomever is recommended by industry). These evaluations will be used to guide the optimization of treatment parameters from both a toxicological (maximization) and phytotoxicological (minimization) perspective.

Phase V. Quantify residues that result from exposure to MB, PH3, and PH3-oxygen mixtures at dosages efficacious against the most tolerant stage of each species in commercial trials.

Phase VI. Optimize the PH3-oxygen mixture to control the most tolerant stage of each species in as short a treatment time as possible at 35 °F.

2013 OBJECTIVES (planned)

Year 2 – MB & PH3: confirmatory scale.

Phase II. Perform confirmatory MB fumigations in triplicate 9 1ft³ chambers with 10,000 SWD specimens and 3,000 BMSB (most tolerant stage of each) while fruit is packed as recommended by industry. To ensure adequate exposure for complete mortality, fumigant concentrations will be measured throughout fumigations. Sorption and box effects on fumigation will be quantitatively analyzed and reported.

Phase III. Perform confirmatory PH3 as well as PH3-oxygen mixture fumigations in triplicate 9 1ft³ chambers with 10,000 SWD specimens and 3,000 BMSB (most tolerant stage of each) while

fruit is packed as recommended by industry. To ensure adequate exposure for complete mortality, fumigant concentrations will be measured throughout fumigations. Sorption and box effects on fumigation will be quantitatively analyzed and reported.

Phase IV. Document phytotoxicity that occurs from MB and PH3 exposure at dosages that are efficacious for killing the most tolerant stage of each species in confirmatory trials.

2012 BUDGET REQUEST

Salaries and Benefits

GS-3 Lab Assistant (50%):	15,344
---------------------------	--------

Supplies and Expenses

rearing	1,000
fumigants	500
travel	2,000

Subtotal:	\$18,394
-----------	----------

USDA-ARS overhead (11.1%)	2,023
---------------------------	-------

<u>Total:</u>	<u>\$20,417</u>
---------------	-----------------

2013 BUDGET PROJECTION (*confirmatory testing*)

\$15,000